भारतीय मानक
Indian Standard

IS 164 : 2023

सड़क चिह्नांकन के लिए तैयार मिश्रित रंग रोगन — विशिष्टि

(तीसरा पुनरीक्षण)

Ready-Mixed Paint for Road Marking — Specification

(Third Revision)

ICS 87.060.20

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February 2023 **Price Group 8**

Paints, Varnishes and Related Products Sectional Committee, CHD 20

FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Paints, Varnishes, and Related Products Sectional Committee had been approved by the Chemical Division Council.

This standard was first published in 1951 and was largely based on the interim coordinated draft prepared by the Coordinating Subcommittee on Specifications for Paints and Allied Stores of the Subcommittee of the No. 5 Standing Committee on Specifications for Paints and Allied Stores of the General Headquarters, India (Army Headquarters). This was initially revised in 1981 with a view to improve the performance of traffic paints after receiving request from the Ministry of Shipping and Transport and IRC. After conducting laboratory tests and field trials on one-way and two-way traffic roads in New Delhi over a period of 18 months, it was brought out that a laboratory test for wear resistance for over 6 h would correspond to actual performance of the material to approximately 7 months on roads. However, two grades of the material, depending on its wear resistance, had been included in the revision that is, Grade 1 for over 6 h of wear resistance, where quality would be decidedly better, and Grade 2 for 1 h to 6 h of wear resistance. Additional requirements for recoating property and flash point had been specified. The title of the standard had also changed.

In second revision, taking the cognizance of fact that lead exposure to human being, is injurious to health and having adverse impact on human health and safety. Therefore, lead limit up to 300 ppm had been introduced in the standard.

Additionally, a scheme for labelling environment friendly products, known as ECO-Mark, had been introduced at the instance of the Ministry of Environment and Forests (MoEF). The ECO-Mark is administered by the Bureau of Indian Standards (BIS) under the *Bureau of Indian Standards Act*, 2016 as per the Resolution No. 71 dated 20 February 1991 published in the Gazette of the Government of India. For a product to be eligible for ECO-Mark, it shall also carry Standard Mark of BIS for quality besides meeting additional optional environment friendly (EF) requirements.

In this revision, grade classification has been removed as the technical committee observed that the grades classification based on only wear resistance was not covering all the applications of the product. Now, major classification has been introduced resulting in two types of products as per the end use of products, namely:

Type 1	Light duty road marking paint for city/rural road marking, and
Type 2	Heavy duty road marking paint for Highways and Airport runway marking

In addition, several requirements such as early washout resistance, no pickup time, non-volatile matter, volume solid, Taber abrasion, scrub resistance, resistance to accelerated weathering, flexibility and volatile organic compounds (VOC) have been added. Further, the lead restriction limit has been modified from 300 ppm to 90 ppm.

The Committee responsible for formulation of this standard is listed in Annex N.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

READY MIXED PAINT FOR ROAD MARKING — SPECIFICATION

(Third Revision)

1 SCOPE

1.1 This standard prescribes requirements and methods of sampling and test for ready mixed paint for road marking to Indian Standard color golden yellow, and white and black. The material is used for marking roads and highways and in airports for traffic control. The material is also known as traffic paint.

1.2 White and yellow materials are used for traffic control and black material is used for painting kerb stones and traffic islands.

2 REFERENCES

The standards listed in Annex A contain provisions which, through reference in this text constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

3 TERMINOLOGY

For the purpose of this standard definitions given in IS 1303 and the following shall apply.

3.1 Volatile Organic Compounds (VOC) — The volatile matter content minus the water content in road marking paint.

4 TYPES

Ready mixed paint for road marking shall be of two types depending on their end uses

a) Type 1 — Light duty road marking paint for city/rural road marking
b) Type 2 — Heavy duty road marking paint for highways and airport runway marking

5 REQUIREMENTS

5.1 Composition

The material shall be of such a composition as to satisfy the requirements of this standard.

5.2 Applications

The material shall be supplied in such consistency that this paint shall be suitable for application by brushing, spraying or by using any commercial stripping equipment after thinning with a suitable thinner. The thinner to be used shall be specially marked on the container. The material when tested as prescribed in Annex B shall pass the test.

5.3 Durability

The material when tested as prescribed in Annex C shall show no sign of cracking, flaking, peeling off, breakdown or more than slight fading darkening of colour.

5.4 Lead Restriction

The material shall be tested for restriction from lead in accordance with IS 101 (Part 8/Sec 5), or by Atomic Absorption Spectrometer (AAS) or by ICP. When thus tested the material shall not contain lead or compounds of lead or mixtures of both, calculated as metallic lead exceeding 90 ppm (*see* Note).

NOTE — When no lead is used during production (lead free).

5.5 The material shall also comply with the requirements given in Table 1.

5.6 Optional Requirement for ECO-Mark

5.6.1 *General Requirements*

5.6.1.1 The product shall conform to the requirements for quality, safety and performance prescribed under **5.1** to **5.5**.

5.6.1.2 The manufacturer shall produce to BIS environmental consent clearance from the concerned State Pollution Control Board as per the provisions of *Water* (*Prevention and Control of Pollution*) *Act*, 1974 and *Air* (*Prevention and Control of Pollution*) *Act*, 1981 along with the authorization, if required under the *Environment* (*Protection*) *Act*, 1986 and the rules made thereunder, while applying for ECO-Mark.

5.6.2 *Specific Requirements*

5.6.2.1 The product shall contain not more than 5 percent, by mass, volatile organic compounds, when tested according to the method prescribed in IS 101 (Part 2/Sec 4).

Table 1 Requirements for Ready Mixed Paint for Road Marking

(*Clauses* 5.5 *and* 8.1)

Sl No.	**Characteristic**	**Requirement**		**Method of Test, Ref to**	
		Type 1	Type 2	IS 101	Annex
(1)	(2)	(3)	(4)	(5)	(6)
i)	Drying time, *Max*				
	a) Surface dry	30 min	20 min		
	b) Hard dry	60 min	60 min	(Part 3/Sec 1)	−
ii)	Consistency	Smooth and uniform and suitable for application by brushing without appreciable drag on the brush	Smooth and uniform and suitable for application by brush/spray or other suitable method	−	D
iii)	Finish	Smooth and matt to semi-gloss or full gloss as agreed to between the purchaser and the supplier		(Part 3/Sec 4)	−
iv)	Colour	Close match to the ISC colour where specified or to the approved sample where IS colour is not specified (*see* IS 5)		(Part 4/Sec 2)	−
v)	Wet opacity, percent	±15 against approved sample or the value declared by the manufacturer		(Part 4/Sec 1)	−
vi)	Recoating property	To pass the test		−	E
vii)	Resistance to bleeding	Shall not show any bleeding		−	F
viii)	Viscosity, KU	100 ±10	85±10	(Part 1/Sec 5)	−
ix)	Viscosity in KU after accelerated stability	Shall be within ± 10 percent of the value declared as specified in (viii)		(Part 1/Sec 5)	−
x)	Mass in kg/10 l	Shall be within ± 3 percent of the value declared by the manufacture		(Part 1/Sec 7)	−
xi)	Keeping properties	Not less than one year from the date of manufacturing		(Part 6/Sec 2)	−
xii)	Early wash out resistance, min, less than	−	90	−	G
xiii)	No pick up time, min, *Max*	−	30	−	H
xiv)	Non Volatile matter, Min, *percent*	55	70	(Part 8/sec 2)	−
Xv)	Volume solid, *Min*	35	55	(Part 8/sec 6)	−
xvi)	Taber Abrasion resistance, mg weight loss after 500 cycles using CS10 wheel with 500 g on each load, *Max*	−	75	−	J
xvii)	Scrub resistance	Shall pass the test at 500 cycles	Shall pass the test at 1000 cycles	−	K

Table 1 (*Concluded*)

xviii)	Resistance to accelerated weathering, h, *Min*	−	500	−	L
xix)	Flexibility	−	No visible cracking, flaking, or chipping	(Part 5 /sec 2)	−
xx)	VOC, percent, *Max*	5	5	(Part 2 /sec 4)	−
xxi)	Resistance to wear, h	1 to 6	Over 6	−	M

NOTES

1 The working solvent shall, however, be same as that used in manufacture of the material and declared on the container.

2 For match against IS color, IS 5 shall be used.

3 Unless specified otherwise pure chemicals and distilled water (*see* IS 1070) shall be employed in tests.

4 Unless mentioned in specific test method/annexes, all testing to be carried out for Type 1 at 25-35 µm dry film thickness (71-100 µm wet film thickness) and Type 2 at 300-400 µm dry film thickness (545–727 µm wet film thickness).

5.6.2.2 The product shall not contain more than 0.1 percent by mass (as metal), of any toxic metals such as cadmium, chromium (VI) and their compounds when tested by the relevant atomic absorption spectrophotometric methods.

5.6.2.3 The product shall not be manufactured from any carcinogenic ingredients.

NOTE — The Central Drugs Research Institute and Industrial Toxicological Research Centre would furnish a list of carcinogenic ingredients to BIS and would also keep BIS informed about the change therein.

6 PACKING AND MARKING

6.1 Packing

Unless otherwise agreed to between the purchaser and the supplier, the paint shall be packed in sound metal containers conforming to IS 1407 or IS 2552. The packing is subject to the provisions of the law in force in the country at that time.

6.1.1 The ECO marked product shall be packed in such packages which shall be recyclable/reusable or biodegradable. It shall be accompanied with instructions for proper use so as to maximize product performance and minimum wastage.

NOTE — Subsequently the parameters evolved for packaging material/packages for ECO-Mark which are being separately notified/circulated, shall also apply.

6.2 Marking

The containers shall be marked with the following information:

a) Name and colour of the material;
b) Manufacturer's name and his recognized trade-mark, if any;
c) Volume in litre of the material;
d) Batch No. or lot No. in code or otherwise;
e) Month and year of manufacture;
f) Lead content, *Max*; and
g) A cautionary note as below:

    1) Keep out of reach of children.
    2) Dried film of this paint may be harmful if eaten or chewed.
    3) This product may be harmful if swallowed or inhaled.

6.2.1 The containers may also be marked with the Standard Mark.

6.2.2 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations made thereunder. The details of conditions under which a license for the use of the Standard Mark may be granted to manufacturers or producers, may be obtained from the Bureau of Indian Standards.

6.2.3 In case of products certified for ECO-Mark three major ingredients and hazardous chemicals shall be marked on the container.

6.2.3.1 The criteria for which the product has been labelled as ECO-Mark may also be marked on the container.

6.3 The containers, excluding those containing water based paint, shall also be marked 'HIGHLY FLAMMABLE LIQUID' in, red letters (either printed on the label affixed to the container or lithographed or stenciled thereon with indelible ink) in a type size of not less than 50 mm. In addition, all containers for storage and transport shall comply with the requirements of latest issue of Red Tariff and requirements as laid down from time-to-time by the Chief Inspectorate of Explosives, Government of India, for packing, storage and transit of flammable liquids and the Boards of Trade Regulations as applicable thereon for transport by steamers.

6.4 Other details of packing and marking shall be in accordance with instructions given by the purchaser.

7 SAMPLING

7.1 Representative samples of the material shall be drawn and prepared as prescribed in IS 101 (Part 1/Sec 1).

7.2 Preparation of Test Samples for Drying Time, Durability and Other Tests

For these tests, the standard bituminous surface shall be prepared as follows:

7.2.1 *Material*

Composition	*Percent by Mass*
a) Bitumen, of penetration 60 to 80 at 27 °C	12
b) Sand, passing 425 micron IS Sieve and retained on 250 micron IS Sieve [*see* IS 460 (Part 1)]	76
c) Filler, cement (*see* IS 269)	12

7.2.2 *Preparation*

Heat the bitumen and sand separately at 150 °C to 190 °C. When dry, thoroughly mix them at the same temperature and add the filler. Fill the hot bituminous material (*see* **7.2.1**) in the circular cavity of the test track and level the surface suitably by means of a spatula. Subsequently, compact it as follows or by any suitable compacting machine. Keep a circular disc made of mild steel sheet of about 3.5 mm thickness and diameter of about 298 mm to the inner side of the test track over the surface. Compact by means of Marshall Compaction Hammer (*see* Fig. 1) first at the centre of the plate and later at 4 uniformly distributed diagonal points over the remaining area by lifting and dropping the hammer 10 times at each point. This hammer consists of a flat circular tamping face and 450 grams sliding weight with a free fall of 450 mm as shown in Fig. 1.

7.2.3 *Procedure*

Apply a coat of the material uniformly by brushing to give a dry film weight commensurate with the weight in kg/10 l of the material as specified in 101 (Part 3/Sec 4) over the standard bituminous surface prepared as in **7.2.2**, not less than 20 mm in thickness on a suitable base.

7.2.3.1 Prepared test panel then subjected to the drying time test as specified in IS 101(Part 3/Sec 1).

7.2.3.2 Allow the surface panel to air-dry for 24 h. Prepared and dried test panel then subjected to the durability test as per Annex C as soon as possible.

7.2.3.3 Allow the surface panel to air-dry for 1 h. Maintain the panel at 50 °C for 1 h. Prepared test panel then subjected to the bleeding test as specified in IS 101 (Part 7/Sec 4) as soon as possible.

7.3 Criteria for Conformity

A lot shall be declared as conforming to the requirements of this standard if the test results of the composite sample satisfy the requirements given in **5.1** to **5.5**.

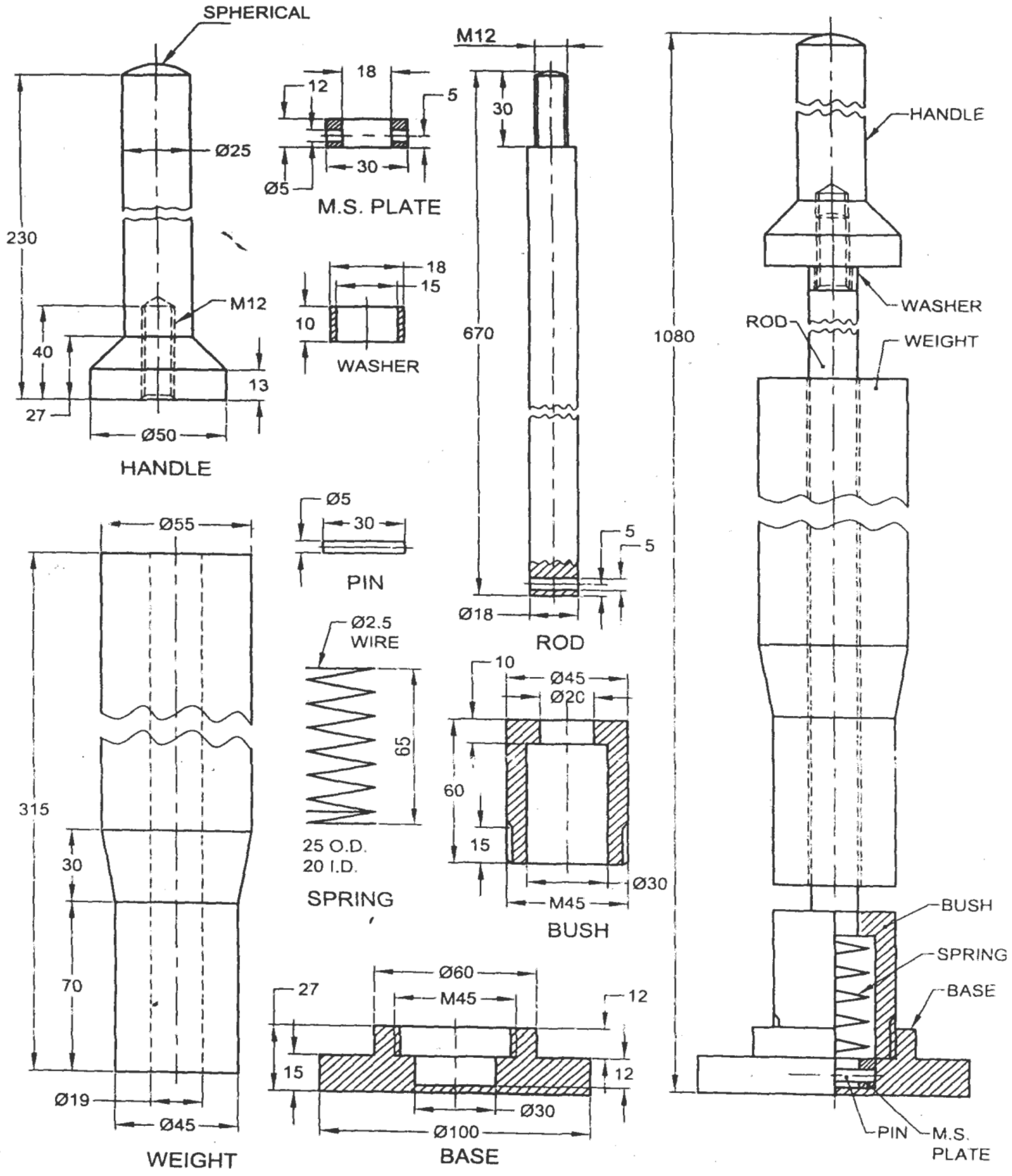
8 TEST METHODS

Tests shall be conducted as prescribed in **5.1** to **5.5** and the test methods referred in co1 (4) and (5) of Table 1.

8.2 Quality of Reagents

Unless specified otherwise pure chemicals and distilled water (*see* 1S 1070) shall be employed in tests.

NOTE — ‘Pure chemicals’ shall mean chemicals that do not contain impurities which affect the results of analysis.



a) DETAIL DRAWING OF MARSHAL COMPACTION HAMMER

b) ASSEMBLY DRAWING OF MARSHAL COMPACTION HAMMER

All dimensions in millimeters.

FIG. 1 MARSHAL COMPACTION HAMMER

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
IS 5 : 2007	Colours for ready mixed paints and enamels (*sixth revision*)
IS 101	Methods of sampling and test for paints, varnish and related products:
(Part l)	Test on liquid paints (general and physical),
(Sec 1) : 1986	Sampling (*third revision*)
(Sec 2) : 1987	Preliminary examination and preparation of samples for testing (*third revision*)
(Sec 3) : 1986	Preparation of panels (*third revision*)
(Sec 6) : 1987	Flash point (*third revision*)
(Sec 7) : 1987	Mass per 10 litres (*third revision*)
(Part 2)	Test on liquid paints (chemical examination),
(Sec 1) : 1988	Water content (*third revision*)
(Sec 2) :1986	Volatile matter (*third revision*)
(Part 3)	Tests on paint film formation,
(Sec 1) : 1986	Drying time (*third revision*)
(Sec 4) : 1987	Finish (*third revision*)
(Part 4)	Optical tests on paint films,
(Sec 1) : 1988	Opacity (*third revision*)
(Sec 2) : 1989	Colour (*third revision*)
(Part 6)	Durability tests on paint films,
(Sec 2) : 1989	Keeping properties (*third revision*)
(Part 7)	Environmental tests on paint films,
(Sec 4) : 1990	Resistance to bleeding of pigments (*third revision*)
(Part 8)	Tests for pigments and other solids,
(Sec 1) : 1989	Residue on sieve (*third revision*)
(Sec 5) : 1993	Lead restriction test (*third revision*)
IS 269 : 2013	Specification for 33 grade ordinary portland cement
IS 384 : 2002	Brushes, paints and varnishes, flat (*fifth revision*)
IS 460 (Part 1): 1985	Specification for test sieves: Part 1 Wire cloth test sieves
IS 1070 : 1992	Reagent grade water (*third revision*)
IS 1303 : 1983	Glossary of terms relating to paints (*second revision*)
IS 1407 : 1980	Round paint tins (*second revision*)
IS 2552 : 1989	Steel drums (galvanized and ungalvanized) (*third revision*)

ANNEX B

(*Clause* 5.2)

APPLICATIONS

B-1 GENERAL

B-1.0 The material when applied by brushing form an even and uniform coat without poured or spilled upon the surface and when applied by spraying form an even and uniform coat.

B-2 SURFACE

B-2.1 Standard bituminous surface shall be prepared as prescribed in **7.2**.

B-3 PROCEDURE

B-3.1 Brushing

B-3.1.1 *Apparatus*

Flat brush conform to IS 384 shall be of a suitable size.

B-3.1.2 *Applications*

Ensure that the brush shall be clean, free from loose hair. The material shall be applied by brushing to obtain an even and uniform coat and shall not be poured or spilled upon surface.

B-3.1.3 *Observations*

The paint shall be deemed to have complied with these requirements if the paint is found to be suitable for application by brushing without any appreciable drag on the brush at room temperature 21 °C to 38 °C.

B-3.2 Spraying

B-3.2.1 *Apparatus*

A suitable spray gun with adjustable size of nozzle cap.

B-3.2.2 *Applications*

Clean thoroughly the spray gun. Ensure that it is fitted with correct size of nozzle and air cap. Adjust the air pressure in accordance with the viscosity (consistency) of the material. The paint shall be sprayed carefully to obtain an even and uniform coat.

B-3.2.3 *Observations*

The paint shall be deemed to have complied with this requirement if the paint is found to be suitable for application by spraying at room temperature 21 °C to 38 °C.

ANNEX C

(*Clause* 5.3)

TEST FOR DURABILITY

C-0 GENERAL

C-0.1 Outline of the Method

A film of the material prepared on a standard bituminous surface is exposed to atmosphere for 25 days. At the end of the period, the film is subjected to water spray for stipulated period and the condition of the film examined.

C-1.1 Standard Bituminous Surface

Prepare the surface as prescribed in **7.2.3** and **7.2.3.2**.

C-2 PROCEDURE

C-2.1 Expose the prepared panel as in **C-1.1** outdoor under dry conditions at an angle of 45° facing south for 25 days. At the end of the 25 day period, subject the panel to a fine spray of water at a temperature not above 30 °C for 6 h daily, from 08 00 h to 14 00 h for 6 days. During the spray of water, the panel shall remain exposed facing south at an angle of 45°.

C-2.1.1 A suitable spray is provided by a water supply through a hose at a pressure of 140 g/cm^2.

C-2.2 Observations

The paint film, when tested in the above manner, shall not show signs of flaking or peeling or other evidence of breakdown, and more than slight fading of colour.

ANNEX D

[*Table* 1, *Sl No.* ii)]

CONSISTENCY

D-1 APPARATUS

D-1.1 Palette Knife or Metal Rod

D-1.2 Paint Brush

D-1.3 Surface

D-1.3.1 Unless specified otherwise, standard bituminous surface shall be prepared as prescribed in **7.2.**

D-2 PROCEDURE

D-2.1 Insert a clean metal rod or palette knife into the original container and examine the nature of settling.

D-2.2 Observations

The material shall not cake hard inside the container and shall be in such a condition that stirring easily produces a smooth uniform paint suitable for brushing on the standard bituminous surface.

ANNEX E

[*Table* 1, *Sl No.* vi)]

RECOATING PROPERTY

E-0 OUTLINE OF THE METHOD

A coat of the material is applied on a standard bituminous surface. After allowing it to dry for specified period, a second coat is applied to test the ability of the material to take up the second coat.

E-1 PROCEDURE

E-1.1 Apply one coat of the material by brushing on a standard bituminous surface as prepared in **7.2** and allow to air-dry for 24 h. Apply a second coat of the material at the end of this period.

E-1.2 Observations

The requirement of the standard shall be taken as having been satisfied if it is possible to apply the second coat without lifting or working up of the first coat.

ANNEX F

[*Table* 1, *Sl No.* vii)]

RESISTANCE TO BLEEDING

Prepare a standard bituminous surface as specified in **7.2** and perform the bleed resistance test according to IS 101 (Part 7/Sec 4).

ANNEX G

[*Table* 1, *Sl No.* xii)]

EARLY WASH OUT RESISTANCE

G-0 OUTLINE OF THE METHOD

The painted panels, applied to a specified wet film thickness on glass panel, are kept at environmental chamber as per specific temperature and humidity to check drying.

G-1 APPARATUS

G-1.1 Environmental Chamber

G-1.2 Clean Glass Panel

G-2 PROCEDURE

Representative sample of the material shall be drawn and prepared as prescribed in IS 101 (Part 1/Sec 1). Draw down the paint on a clean smooth glass panel prepared as per IS 101 (Part 1/Sec 3) to a wet film thickness of 325 µm to 335 µm. Place the painted panel immediately in environmental chamber maintained at (23 ± 2) °C and (90 ± 3) percent relative humidity. Perform the early wash out resistance test as per below.

Place the test panel in a horizontal position at a height such that when the thumb is placed on the film, the arm of the operator is in a vertical line from the wrist to the shoulder. Bear down on the film with the thumb, exerting the maximum pressure of the arm, at the same time turning the thumb through an angle of 90° in the plane of the film.

G-3 OBSERVATION

The paint film when tested in the above manner shall not show any loosening, detachment, wrinkling, or other evidence of distortion of the film.

ANNEX H

[*Table* 1, *Sl No.* xiii)]

NO PICK-UP TIME

H-0 OUTLINE OF THE METHOD

The painted panels, applied to a specified wet film thickness on glass panel, is tested for determining the no-pick-up time of a traffic paint by a rubber wheel.

H-1 APPARATUS

H-1.1 Clean Glass Panel

H-1.2 The apparatus as shown in Fig 2 shall consist of a steel cylinder of the shape and dimensions as indicated, fitted with two replaceable O-rings and a ramp of shape and dimensions as shown. The detailed dimensional requirements of the steel cylinder are given in Fig. 2. The total weight of the assembly complete with O-rings shall be 5 386 g ± 28 g

The replaceable O-rings shall be made of synthetic rubber or rubber-like material.

The dimensional requirements of the O-ring are as follows:

Outside diameter	104 mm (4 $\frac{1}{8}$ inch)
Inside diameter	85 mm (3 $\frac{3}{8}$ inch)
Cross section	9.5 mm ($\frac{3}{8}$ inch)

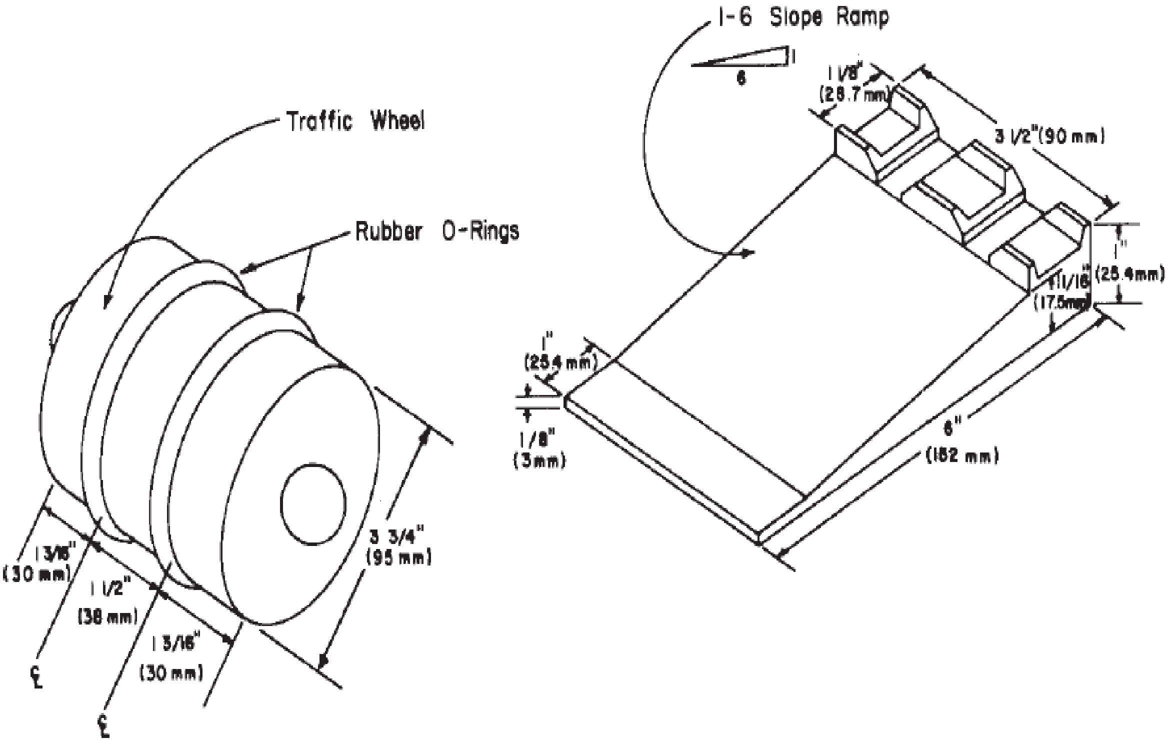


FIG. 2 TRAFFIC PAINT DRYING TIME WHEEL AND RAMP

H-2 PROCEDURE

Representative sample of the material shall be drawn and prepared as prescribed in IS 101 (Part 1/Sec 1). Draw down the paint on a clean smooth glass panel prepared as per IS 101 (Part 1/Sec 3) to a wet film thickness of 390 µm to 410 µm for at least 3 in (75 mm) in width.

Record the time of application. Allow the panel to dry in a horizontal position under the laboratory conditions specified at (23 ± 2) °C and (50 ± 3) percent relative humidity.

Test the paints used with drop-in beads without beads unless otherwise specified or agreed upon between the purchaser and the seller.

Butt the glass plate against the ramp. At regular intervals remove the wheel from its rest, hold against the rest as a starting point, then free roll the weighted wheel down the inclined ramp and over the paint film with each roll of the wheel over a new wheel path. Position the wheel properly so that a clean surface of the wheel will come into contact with the paint film. As many as three passes of the wheel can be made before the wheel needs to be cleaned. This can be done with a rag saturated with acetone. It is best to set aside the wheel after washing until all the solvent has evaporated.

Note the end point for no-pick-up time when no paint adheres to the rubber rings of the test wheel when it is rolled over the paint film. As the end point is approached, roll the weighted wheel over the paint film every 30 s.

H-3 OBSERVATION

Report the time elapsed between application of the paint and the end point as the drying time for no-pick-up of the traffic paint.

ANNEX J

[*Table* 1, *Sl No.* xvi)]

TABER ABRASION RESISTANCE

J-0 OUTLINE OF THE METHOD

The test paint is applied to a specified, properly prepared, metal panel. After aging, the coated panel is placed on Taber Abrasion machine. A specified load is applied, and specified Taber Wheel is selected, and 500 revolutions are performed and weight loss in milligrams is calculated.

J-1 APPARATUS

J-1.1 Taber Abrasion Machine

J-1.2 Vacuum suction system and adjustable height vacuum pick-up nozzle of 8 mm diameter to remove debris and abrasive particles from the specimen surface during testing.

J-1.3 Abrasive Wheels Calibrase — CS-10

J.1.4 Weighing Scale — With minimum 200 gcapacity and least count of 0.1 mg.

J-1.5 Oven

J-1.6 Mild Steel panel, 4 inch x 4 inch x 1.2 mm.

J-2 PROCEDURE

Clean the metal panels thoroughly with a suitable solvent, and buff lightly with fine emery paper. Prepare at least 3 panels for each paint to be tested. Examine the test paint, remove any skins that are present, stir with a paddle to loosen any settled pigment, and mix thoroughly. Apply paint on the metal panels using a film applicator having wet film thickness of 170 µm to 200 µm or as per specified by the purchaser. Air dry the coated metal panels for 24 h. Keep the dried metal panel in oven at 105 °C for 3 h, then remove it and cool to room temperature. Take the weight of each panel under test. Mount the coated metal panel on the turntable of Taber Abrasion machine by applying 500 g weights or as per specified by purchaser. Also select Abrasive wheel CS-10. Start the Abrasion machine and vacuum pick-up. The coated metal panel is then subjected to 500 revolutions. At the end of revolutions, calculate the weight loss in milligrams. Repeat the test for remaining two panels. For passing the test reading of minimum two specimen shall meet the requirement.

J-3 OBSERVATION

The paint film, when tested in the above manner, weight loss in milligrams to be recorded.

ANNEX K

[*Table* 1, *Sl No.* xvii)]

SCRUB RESISTANCE

K-0 OUTLINE OF THE METHOD

The painted panels, applied to a specified wet film thickness on specified panels for determining the resistance of paints to erosion caused by scrubbing, referred to herein after as “scrub resistance”.

K-1 APPARATUS

K-1.1 Straight Line Washability Machine (*see* Fig. 3), consist of following:

K-1.1.1 *Nylon Bristle Brush and Accessories*, total weight 454 g ± 10 g.

K-1.1.2 *Brass Shims,* 12.7 by 0.25 mm, its length can be fitted to the width of the drawdown plate.

K-1.1.3 *Film Applicator,* having 0.18 mm (7-mil) clearance and 6.25 mm (1⁄4 in) edge and width of 135 mm (51⁄4 in).

K.1.2 *Black poly* (*vinyl chloride*) *or poly* (*vinyl acetate*) *copolymer sheets,* 165 x 432 mm dimension. The sheets must be smooth, matt and plasticizer free.

K-2 REAGENTS

K-2.1 *Abrasive Scrub Medium,* laboratory standardized abrasive scrub medium consisting of the following:

Chemicals	*Grams*
Water, distilled or deionized	49.4
A Hydroxyethyl cellulose	0.8
Ammonium hydroxide, 28%	0.1
Detergent	2.0
Trisodium phosphate, anhydrous	2.0
Silica	45.0
Acetic acid (glacial)	0.70
Preservative	0.1

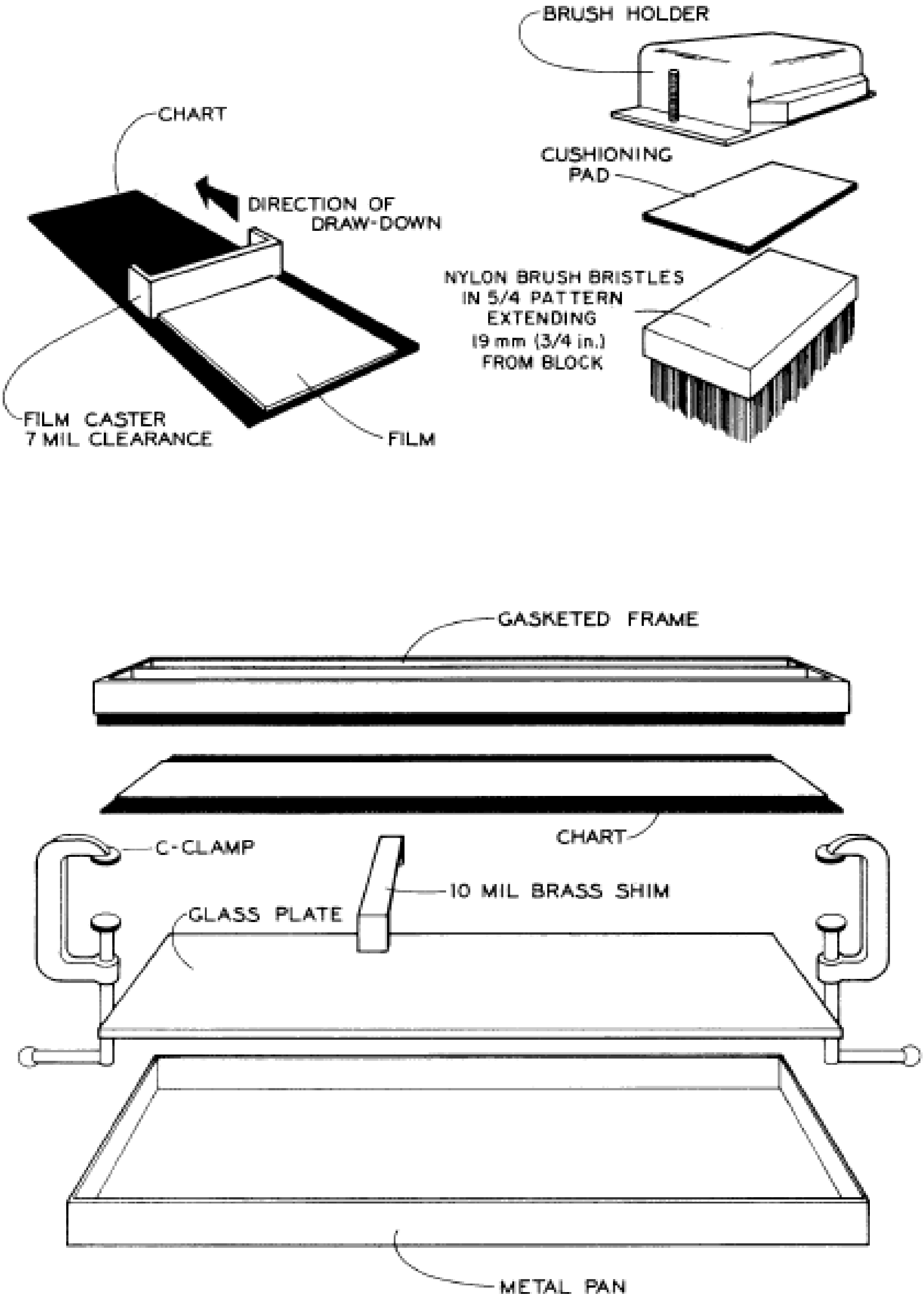


FIG. 3 STRAIGHT LINE WASHABILITY MACHINE

K-3 PROCEDURE

Draw the representative sample of the material and prepare panels as prescribed in IS 101 (Part 1/Sec 3). Apply the paint onto above plastic sheet using 150 µm (60 to 70 µm DFT) film applicator. Allow the paint film to dry at ambient condition for 168 h.

Soak the brush in water overnight. Clean the plate and set it in the pan of the washability tester. Ensure that the shim is smooth and free of burrs and placed perpendicular to the path of the brush. Wipe the test panel carefully and place it on top of the shimmed plate with the painted side up. Be sure that there are no defects in the film above the shim and that the test area is level. Place the frame over the drawdown being sure that the entire gasket is on the painted surface. Clamp the gasket in place. The clamps should be tight enough to ensure close contact, but not tight enough to cause warping of the panel.

Before beginning the test, it should be noted that the brush has been preconditioned for 400 cycles as outlined in above point. Remove the brush and shake vigorously to remove any excess water. Stir the abrasive scrub medium and spread 10 g uniformly over the brush bristles. Place the brush at one end of the path. Wet the panel with 5 ml of water in the path of the brush.

Start the test. After each 400 cycles before failure, remove the brush (do not rinse), add 10 g of stirred abrasive scrub medium and place 5 ml of water on the path of the brush before continuing.

Record the number of cycles to remove one continuous thin line of paint film across the 12.7 mm (1/2 inch) width of the shim. Stop the machine and wipe off the shim area to determine, if necessary, if the end point is achieved.

Test two of the drawdowns. If the two results differ by more than 30 percent of the average, test the third drawdown. If one of the three results is obviously discrepant, discard it, then average the results from the remaining drawdowns

K-4 OBSERVATION

Report the mean number of cycles to failure.

ANNEX L

[*Table* 1, *Sl No.* xviii)]

RESISTANCE TO ACCELERATED WEATHERING

L-0 OUTLINE OF THE METHOD

Suitably painted substrates are exposed to artificial irradiation of a defined intensity, humidity and water spray representing natural sunlight and weathering. Time to time, the painted surface is observed for chalking, checking, cracking and discolouration.

L-1 PREPARATION OF PANELS

Preferably of sizes 150 mm × 75 mm or any other sizes suitable for accommodating in the UV condensation type apparatus. Select appropriate sizes of asbestos cement panels (*see* IS 2096) with *p*H not more than 10 (preferably between 8 to 10) and brush uniformly one coat of the paint suitably thinned. Air-dry for 8 h and apply a second coat of the paint and again air-dry for overnight and apply a third coat of the material. Air dry for 8 h and then expose the panels at 45° to the horizon.

L-1 APPARATUS

L-1.1 *Accelerated weathering apparatus*

An artificial weathering apparatus of UV condensation type for uniform and controlled exposure to the effects of heat, light, and water with following test condition parameters:

a)	Lamp type	UV 313
b)	Test Cycle	UV — (4 h at 60 °C ± 3 °C) Condensation — (4 h at 50 °C ± 3 °C)
c)	Irradiance	0.67 W/m2/nm
d)	UVB wavelength	295 nm – 325 nm (approx)

L-2 PROCEDURE

The test panels shall be prepared as described under **L-1.** Performance assessment will be done after exposure of 21 days using methods described under **L-2.1, L-2.2, L-2.3, L-2.4, L-2.5 and L-2.6.**

L-2.1 Examine the conditions of the exposed film for the following characteristics:

a) Colour;
b) Flaking;
c) Cracking; and
d) Chalking.

L-2.2 For the above examination, wash the right-hand half of the surface of test panels by pouring water and then wiping with soft cloth. Examine the same half of the test panels at each examination. At the end of the stipulated period for accelerated weathering, examine the two halves of the test panels for the above characteristics. The sample shall be considered satisfactory if the condition of the film in both the halves, the one washed periodically as well as the one washed only for the final examination, is satisfactory by the method of evaluation described in **L-2.3**. Stray film failure due to extraneous causes other than climatic shall be ignored.

L-2.3 Method of Rating

The film of the unexposed panel shall be rated with the following basic values for the respective characteristics:

a) Possessing correct colour	25
b) Freedom from flaking (loss of adhesion and hence lifting)	25
c) Freedom from cracking	25
d) Freedom from chalking	25
Total	100

NOTE — The initial rating of the film may be 100 or less according to the condition of colour, the rating for freedom from flaking, cracking and chalking being always the maximum in the case of unexposed films.

L-2.4 Evaluation of Exposed Films

In recording the condition of exposed films at each examination, express the observed relative values of different characteristics in percentages of the basic value allotted to each characteristic under **L-2.3**. The allotment of performance value should be multiples of 10. For arriving at an assessment multiply the basic value for each characteristic (*see* **L-2.5**) by the percentage awarded for the performance in the test and divide the product so obtained by 100 to obtain the percentage award of the observed value of each characteristic. Take the sum total of these resulting values as the overall assessment.

L-2.5 The following table is intended to serve as a guide for the assessment of emulsion paint film after exposure:

Sl No. (1)	*Characteristic Value* (2)	*Basic Value* (3)	*Performance Value* (4)	*Assessment* (5)
i)	Possessing correct colour	25	70	17.50
ii)	Freedom from flaking (loss of adhesion and hence lifting)	25	70	17.50
iii)	Freedom from cracking	25	60	15.00
iv)	Freedom from chalking	25	10	2.50
				52.50

L-2.6 Result of Exposure

Reckon the period for general breakdown of the exposed film from the date of commencement of exposure to the time when the overall assessment falls below 50 percent or when the performance value of any one characteristic fall below 25 percent of basic value adopted for that characteristic. In the example given above although the overall assessment is 52.50 percent, yet the film is to be regarded as having generally broken down because the performance value of chalking has fallen below 25 percent of its basic value.

ANNEX M

[*Table* 1, *Sl No.* xxi)]

RESISTANCE TO WEAR

M-0 OUTLINE OF THE METHOD

The painted film of the material on a standard bituminous surface is subjected to traction of rubber tyred wheels with specified load and for specified time. At the end of the stipulated period, the surface is examined for wear.

M-1 PROCEDURE

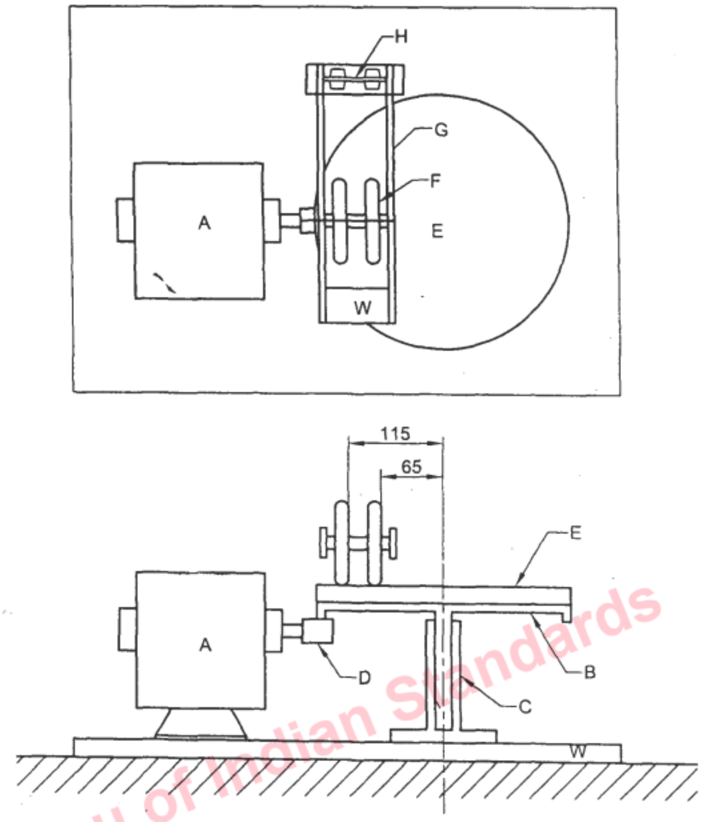
M-1.1 Prepare the paint films of the material and approved sample as prescribed in **7.2** on adjacent sections of a smooth, standard bituminous surface, 6 mm thick, on a 300-diameter disc of suitable base, air-dry for 2 h.

M-1.2 Rotate the painted surface of the disc on a turn table *B*, as shown in Fig. 4, at the rate of 200 rpm by a fractional horsepower motor *A*. Rotate by contact with the painted disc two rubber tyred wheels similar to car tyre composition *F*, each 100 mm in diameter and having a face width of 12.5 mm, linked so as to rotate together in a frame *G*, hinged at *H*, the distances of the nearer edges of the wheel track from the centre of the turn table being 60 and 110 mm respectively. Attach a weight (*W*) to the frame to give a load equivalent of 3.2 kg at the area of contact of the wheels and the painted surface, weight being determined at point of contact by a spring balance. During the test, keep the painted surface wet with water sprayed on the inner edge of the inner wheel track at a rate of 600 ml per hour. Examine visually the wear on both the tracks at regular intervals till the paint wears out completely in one of the tracks. After 6 h of continuous operation, allow rest for 18 h. Continue the testing after 18 h. Again allow rest till the paint wears out completely in one of the tracks. Declare the value in the test report.

M-2 OBSERVATIONS

M-2.1 The material of Type 2 shall be deemed to have passed the test if it wears out only after 6 h.

M-2.2 The material of Type 1 shall be deemed to have passed the test if it wears out between 1 h and 6 h.



of Indian Standards

All dimensions in millimeters

FIG. 4 APPARATUS FOR DETERMINING OF RESISTANCE TO WEAR

ANNEX N

(*Foreword*)

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